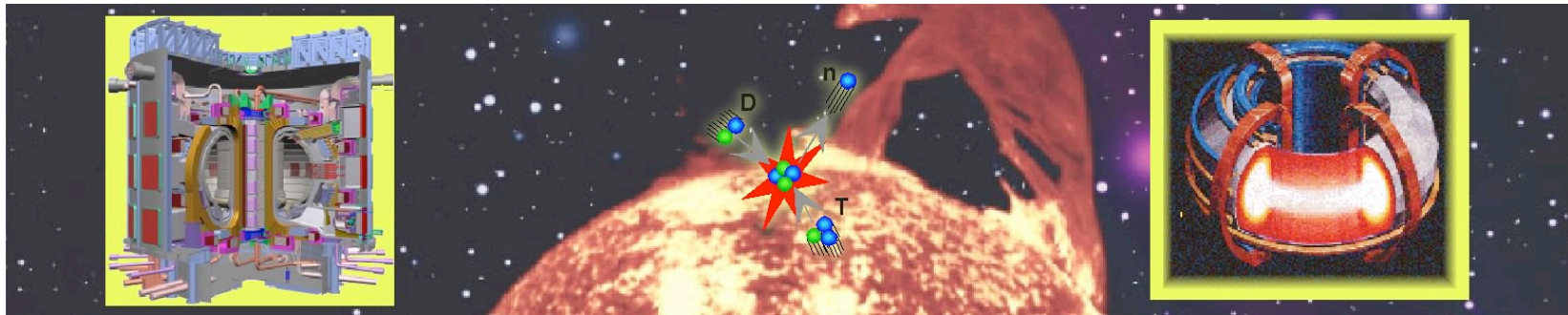


Overview of the US Burning Plasma Organization



- *Leadership team*
- *Council & Topical Group activities*
- *Examples of research efforts*
- *ITER design review*
- *Relationship with ITPA*
- *To-do list*

J. W. Van Dam

USBPO Director
& USIPO Chief Scientist

*Presented to
USDOE Budget Planning Meeting
March 13, 2007*

New Leadership Team (Feb '07)



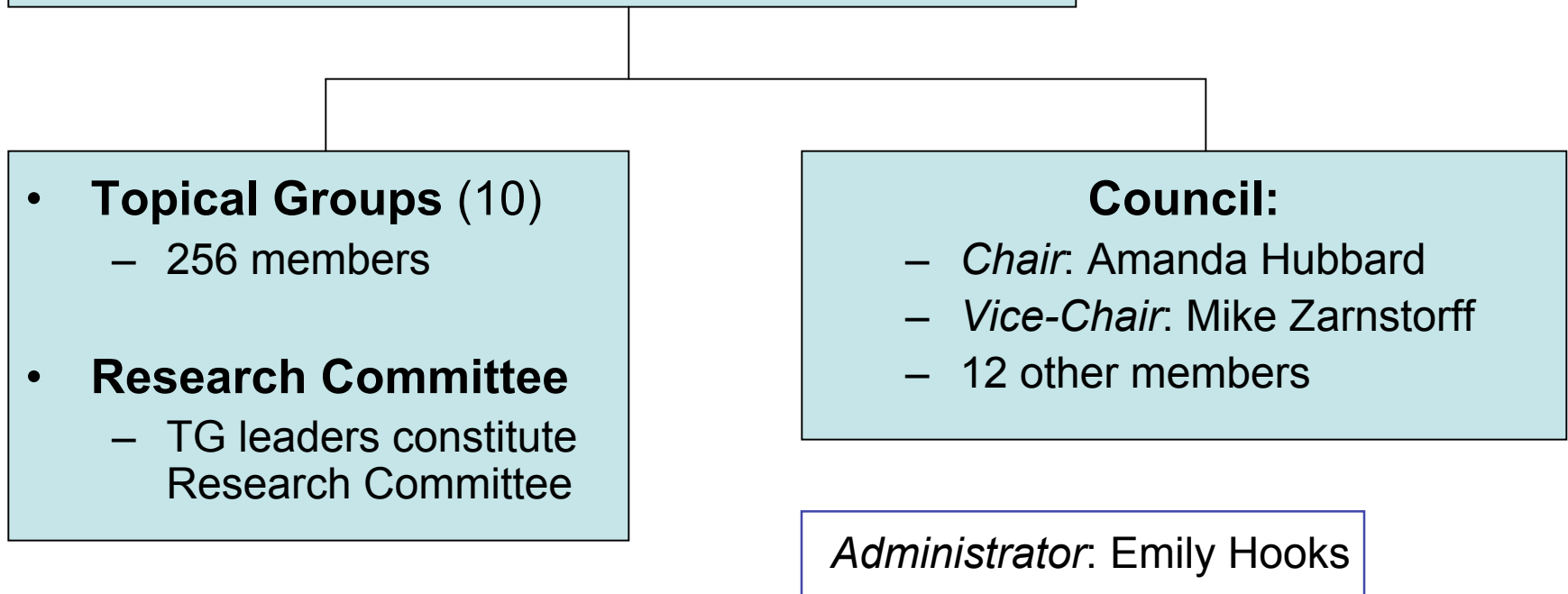
USBPO

Directorate:

- *Director*: James Van Dam
- *Deputy Director*: Chuck Greenfield (~May 1)
- *Asst Director for ITER Liaison*: Nermin Uckan

Appreciation to:

- **Ray Fonck**
- **Tony Taylor**



www.burningplasma.org

Council Members



USBPO

Amanda Hubbard (MIT) — *Chair*
Michael Zarnstorff (PPPL) — *Vice Chair*
Steven Allen (LLNL)
Steven Cowley (UCLA)
Richard Hawryluk (PPPL)
Earl Marmor (MIT)
Gerald Navratil (Columbia)
William Nevins (LLNL)
Martin Peng (ORNL)
David Petti (INL)
Craig Petty (GA)
John Sarff (Wisconsin)
Tony Taylor (GA) — from May 1
George Tynan (UCSD)

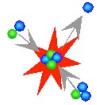
Ex-officio participants:

James Van Dam (Texas)
USIPO Chief Scientist
Stanley Milora (ORNL)
USIPO Chief Technologist

DOE/OFES:

Erol Oktay
ITER & International Division
Gene Nardella
ITER Technology Officer

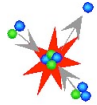
Council Activities



USBPO

- **Charter & Bylaws**
 - Subcommittee led by G. Tynan
 - Describes how the USBPO is constituted, governed, and operated
- **Director search**
 - Subcommittee led by A. Hubbard
 - Solicited nominations, evaluated candidates, and proposed a trio slate, which the Council approved and sent to OFES
- **Strategic planning**
 - Last year, a BPO Task Force prepared the EPAct Report (reported to FESAC at its June '06 meeting)
 - New subcommittee to be led by E. Marmar
 - Prepare for NRC review of the EPAct Report; feed into new FESAC “DEMO Charge” and long-term planning activities

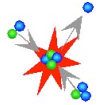
Topical Groups



USBPO

Topical Group	Leader	Deputy Leader
MHD, Macroscopic Plasma Physics	Jon Menard (PPPL)	Chris Hegna (UW)
Confinement and Transport	Paul Terry (UW)	Ed Doyle (UCLA)
Boundary	Dennis Whyte (MIT)	Tom Rognlien (LLNL)
Plasma-Wave Interactions	Cynthia Phillips (PPPL)	Steve Wukitch (MIT)
Energetic Particles	Raffi Nazikian (PPPL)	Bill Heidbrink (UCI)
Integrated Scenarios	Chuck Greenfield (GA) — <i>to be replaced</i>	Chuck Kessel (PPPL)
Fusion Engineering Science	Nermin Uckan (ORNL)	Richard Nygren (SNL)
Modeling and Simulation	Don Batchelor (ORNL)	Jon Kinsey (GA)
Operations and Control	Dave Humphreys (GA)	Dave Gates (PPPL)
Diagnostics	Rejean Boivin (GA)	Jim Terry (MIT) & Steve Allen (LLNL)

Topical Group (TG) Activities



USBPO

- **FY07 ITER Physics Tasks**
 - 76 submitted, 14 selected by BPO to work on (work is underway)
- **ITER design review issue cards**
 - Submitted 13 issue cards
- **Recent events (examples)**
 - Diagnostics TG Workshop (Jan '07): leading to ITER diagnostics review
 - Modeling-Simulation TG conference call (Feb)
 - Energetic Particles TG meetings (April–with TTF Meeting; Nov–with APS/DPP Meeting)
 - Plasma-Wave Interaction TG Workshop (May–with RF Conference)
- **Research Committee guidelines**
 - Discussed at 3 video “retreats” in January
 - Operational guidelines document for how to define tasks, approve and prioritize activities, and report results

ITER Physics Tasks

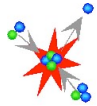


USBPO

- Active coil system for ELM suppression and RWM stabilization ★
- ITER disruption mitigation system design and physics understanding
- Tritium retention and H/D/T control
- Requirements for stabilization of (3,2) and (2,1) NTMs
- Limitations to startup flexibility for advanced scenarios ★
- ELM mitigation
- ICRF antenna performance and coupling studies
- Critical assessment of heating and current drive mix on ITER and impact on achievable scenarios
- Review measurement requirements related to US diagnostic packages
- Evaluate the feasibility of lost and confined fast ion diagnostic systems for ITER ★
- ITER CODAC architecture design
- ICRF heating and current drive scenarios (time-independent)
- Development of improved pedestal and L-H transition predictive capabilities and impact on ITER design and performance
- Locked-modes and error field correction specification

★ = some examples on following pages

Example: Integrated analysis of RWM, ELM, and error field coils for ITER



USBPO

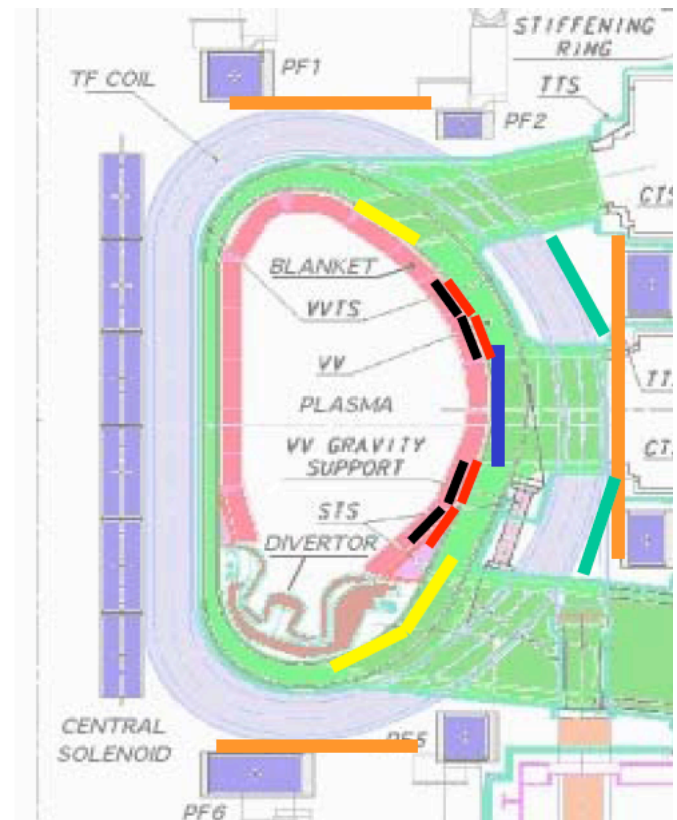
Macroscopic Stability TG (J. Menard, C. Hegna)

- **Questions BPO-MHD task group will attempt to address:**
 - Is there a single coil set that can provide good ELM, EF, RWM control in ITER?
 - If it exists, what are the I, V, power/cooling requirements for such a coil set?
 - Identified as high priority also by ITPA and ITER Design Review (Issue Card RWM-1)

Upper/lower port plug coils

(#2 and #6 are different from original design)

1. Error field correction coils
2. Coils on inner vessel surface
3. Coils around blanket modules
4. Mid-plane port-plug coils
5. On TF, above/below mid-plane
6. Coils on upper/lower port plugs



Example: Startup flexibility for ITER

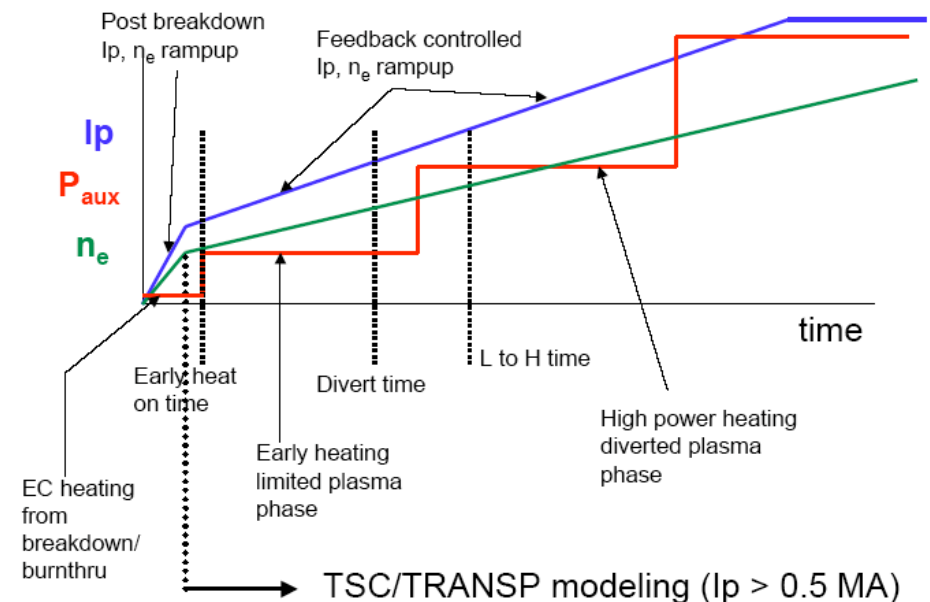


USBPO

Integrated Scenarios TG (C. Greenfield, C. Kessel)

- **Main issue**
 - Can ITER produce a target plasma suitable for advanced regimes (hybrid, steady-state)?
 - Also high priority for ITPA and ITER Design Review
- **Questions to be investigated:**
 - Verify locations where plasma can be initiated, limitations, plasma size, effect of EC pre-ionization, effect of auxiliary heating (burn through)
 - Determine how quickly plasma can be grown while limited, how soon plasma can be diverted, how soon L-H mode transition can occur, and how fast I_p can be ramped up
 - Determine how much power can be injected while the plasma is resting on the limiter, impact of heating on scenario
 - Determine viable heating sources for growth and ramp-up phases, particularly when the plasma is not full size and/or limited

Discharge Phases of Interest



Demonstrate range of safety factor (current) profiles that can be produced using (1) heating/CD timing, (2) density ramping, (3) divert time, and (4) L-H mode transition time

Example: Energetic/alpha particle issues for ITER



USBPO

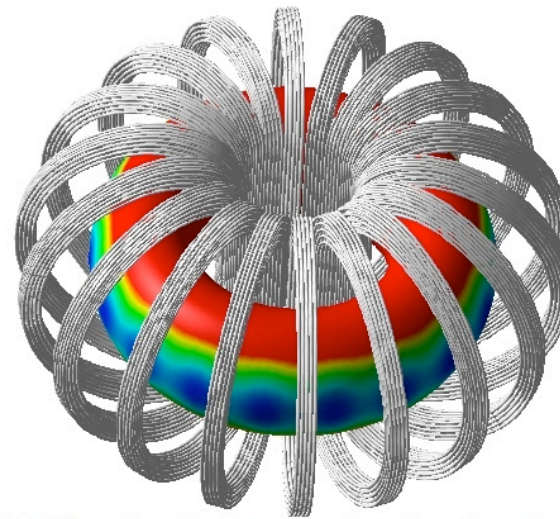
Energetic Particles TG (R. Nazikian, W. Heidbrink)

Activity #1:

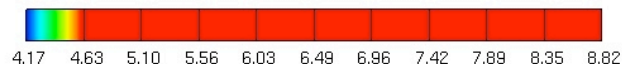
- **Quantify flux and localization of fast ion loss in ITER in presence of ripple and Alfvén eigenmodes (AE)**
 - Design Review task WG1-2.6.7 *Sensitivity studies for AE behavior*
 - Design Review task WG1-3.1 *Ripple losses with ferritic inserts etc.*
- **ITER $\beta=0$ equilibrium with TF ripple**
 - Finite beta analysis needs PF currents
 - Include ferritic inserts

Activity #2:

- **Assess capabilities and needs in fast ion and AE diagnostics**
 - ITPA high priority issue (MHD TG)
 - USBPO Diagnostics Workshop (Jan '07) and ITER diagnostics review (June)
 - Some diagnostics assessments being funded by ITER Project Office



D. Spong



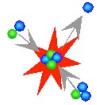
ITER Design Review Urgent Issues



USBPO

- **ITER Design Review working groups (8)**
 - Example: Design Requirements & Physics Objectives WG1 (chair: P. Thomas; US reps: R. Hawryluk and R. Stambaugh)
 - 12 urgent DR&PO issues—Participant Teams requested to address them
 - Preliminary design review (May); finalized design review (Nov)
- **USBPO coordination role**
 - TG leaders recommended names of US scientists qualified to address these issues
 - Also involved in recommendations: VLT for technical issues, ITPA for international
- **Programmatic discussions**
 - US program leaders are considering twin impacts of (1) diversion of effort and (2) additional travel costs
 - DOE has provided a guidance letter to program leaders
 - At same time, DO&PR working group will give feedback on names

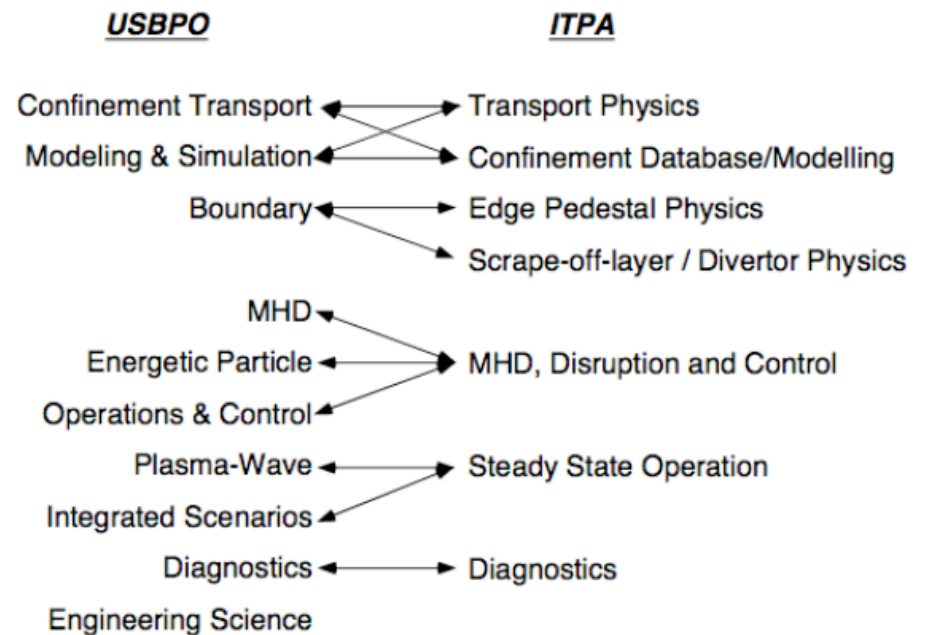
Relationship with ITPA



USBPO

- **Recent document about integrated relationship**
 - Authored by R. Fonck & R. Stambaugh
 - Circulated for comments from USBPO and ITPA
- **Summary**
 - USBPO will be the national base and infrastructure for the US part of ITPA; US ITPA members will be a conduit for USBPO to the international arena
 - ITPA Topical Group members will be USBPO members
 - US coordinators for ITPA Topical Groups will work closely with USBPO Topical Group leaders/deputy leaders
 - USBPO will broadly publicize ITPA activities to US community (e.g., web page, e-News)
 - Effectively, integration at the national level

USBPO - ITPA Topical Group Responsibilities:



To-Do List



USBPO

- **Strategic planning**
 - NRC review; FESAC charge(s)
- **Research activities**
 - ITER Design Review urgent issues
 - ITER Physics Tasks (US commitments)
 - Broader burning plasma issues (USBPO tasks)
- **Coordination**
 - ITPA Coordination Committee meeting (June)
- **CODAC**
 - ITER working group (US rep: M. Greenwald)
- **Outreach**
 - APS Spring Meeting (April)
 - Portable, popular presentation for non-fusion audience